

CLAIMS

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

1. A method for labeling nucleic acids, the method comprising:
 - a) contacting nucleic acid molecules with hydrogen peroxide and a redox-active coordination complex for a time and at concentrations sufficient to produce free-aldehyde moieties on the molecules;
 - b) reacting the aldehyde moieties with amine to produce a condensation product; and
 - c) labeling the condensation product.
2. The method as recited in claim 1 wherein the step of labeling the condensation product further comprises:
 - a) reducing the condensation product; and
 - b) contacting the reduced condensation product with a chromophore.
3. The method as recited in claim 1 wherein the nuclease is a coordi-

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2 nation complex selected from the group consisting of 1,10-phenanthroline-CuII,
 3 bleomycin-Fe(III), EDTA-Fe, ascorbic acid-Cu, methylene-blue-Cu, metallophorphyrin,
 4 or combinations thereof.

1 4. The method as recited in claim 1 wherein the amine is a primary
 2 amine.

1 5. The method as recited in claim 1 wherein the amine is ethylene
 2 diamine or hydrazine or aminated biotin.

1 6. The method as recited in claim 1 wherein the contacting step occurs
 2 in an anaerobic environment.

1 7. The method as recited in claim 1 wherein the step of labeling the
 2 condensation product further comprises reducing the condensation product and cross-
 3 linking the reduced condensation product with a label in one reaction step.

1 8. The method as recited in claim 1 wherein the step of contacting
 2 the nucleic acid molecules with redox-active coordination complex includes contacting
 3 the nucleic acid with a denaturing agent.

1 9. A method for modifying nucleic acids, the method comprising:

2 a) contacting free radicals with the nucleic acids to produce free
 3 nucleic acid bases and aldehyde forms of ribose and deoxyribose;

4 b) contacting the aldehyde forms with an amine to produce a
 5 condensation product;

6 c) reducing the condensation product; and

7 d) labeling the reduced condensation product.

1 10. The method as recited in claim 9 wherein the step of producing free

2 radicals comprises reacting hydrogen peroxide with chemical nucleases.

1 11. The method as recited in claim 10 wherein the chemical nucleases are
2 coordination complexes selected from the group consisting of 1,10-phenanthro-line-
3 Cull, bleomycin-Fe(III), EDTA-Fe, ascorbic acid-Cu, methylene-blue-Cu, metallo-
4 porphyrin, or combinations thereof.

1 12. The method as recited in claim 9 wherein steps d and e occur
2 simultaneously.

1 13. The method as recited in claim 9 wherein step e occurs in anaero-
2 bic conditions.

1 14. The method as recited in claim 9 wherein the nucleic acid is double
2 stranded and wherein the step of contacting the free radicals with the nucleic acids is
3 preceded by the addition of a double-strand weakening agent.

1 15. The method as recited in claim 14 wherein the double-strand
2 weakening agent is a denaturing agent selected from the group consisting of carbonic
3 acid, urea, ethyl carbonate, cyanamide, urethane, and combinations thereof.

1 16. The method as recited in claim 9 wherein the nucleic acid is modi-
2 fied at temperatures below the boiling point of water.

1 17. The method as recited in claim 9 wherein the nucleic acid modifi-
2 cation occurs at between 0 °C and 95 °C.

1 18. The method as recited in claim 9 wherein the free radicals are contacted
2 with the nucleic acids in an anaerobic atmosphere.

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